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10/501,097	07/09/2004	Kazuhiro Yamada	040302-0398	3096

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EXAMINER	
CHUO, TONY SHENG HSIANG	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/501,097	YAMADA, KAZUHIRO	
	Examiner	Art Unit	
	Tony Chuo	1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 April 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-22* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-22* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *09 July 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *4/16/07*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. Claims 1-22 are currently pending. New claims 19-22 have been added. The previous objections to claims 12 and 16 are withdrawn. The previous 112 rejections of claims 3, 5, and 15 are withdrawn. The amended claims do overcome the previously stated 103 rejections. However, upon further consideration, claims 1-22 are rejected under the following new 103 rejections. This action is made FINAL as necessitated by the amendment.

Information Disclosure Statement

2. The information disclosure statement (IDS) submitted on 4/16/07 was filed on 4/16/07. The submission is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Claim Rejections - 35 USC § 103

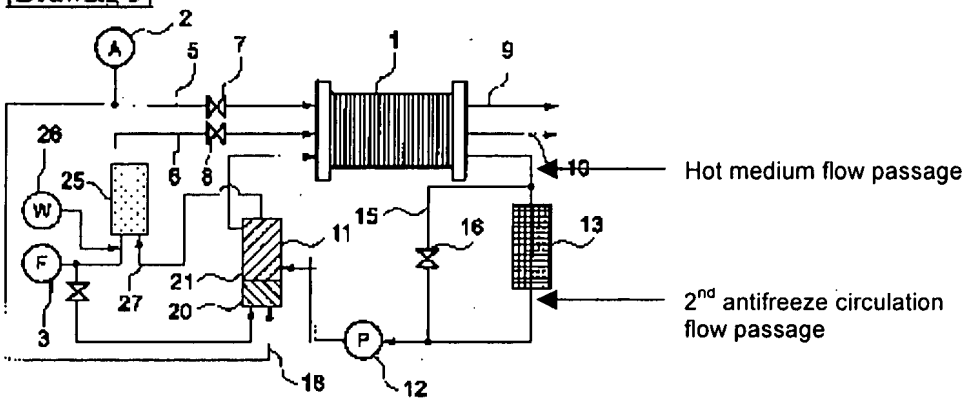
3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1, 7, and 16-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al (JP 2000-164233) in view of Salvador et al (US 6432568).

The Saito reference discloses a fuel cell system comprising: a fuel cell "1" that is cooled by antifreeze solution; a moisture supply means "26" consisting of a water tank and a pump that is adapted to store water to be supplied to the fuel cell; a first antifreeze circulation flow passage "15" to allow the antifreeze solution to be circulated that includes: the fuel cell "1", an antifreeze heating means "11" disposed in the first antifreeze circulation flow passage to heat the antifreeze solution; and a second antifreeze circulation flow passage to allow the antifreeze solution to be circulated that includes: the fuel cell "1", the hot medium flow passage; and a radiator disposed in the second antifreeze circulation flow passage adapted to radiate heat from the antifreeze solution, wherein the second antifreeze circulation flow passage branches away from the first antifreeze circulation flow passage, and wherein the action of circulating the antifreeze solution to the fuel cell and the radiator through the second antifreeze circulation flow passage includes circulating antifreeze solution to the hot medium flow passage (See Drawing 3 and paragraphs [0058], [0060],[0071],[0090]).

[Drawing 3]



However, Saito et al does not expressly teach a hot medium flow passage disposed around a water contact section of the water storage unit to allow the antifreeze

solution, heated by the antifreeze heater, to flow, wherein the hot medium flow passage has an antifreeze inlet, through which the antifreeze solution flow in, that is located at a higher position than an antifreeze solution outlet, through which the antifreeze solution flows out. The Salvator reference discloses a water management system comprising heated engine coolant that is routed through a coolant conduits "29" & "56" and circulated through the fuel cell stack "24" and through a water tank "44", wherein the coolant inlet is located at a position higher than the coolant outlet (See Figure 3 and column 4, lines 11-19).

Examiner's note: Claim 17 is interpreted as invoking 35 USC 112, sixth paragraph by using the "means for" language. The Saito water tank "26" is an equivalent of the means plus function limitation because it performs the same function of storing water to be supplied to the fuel cell and produces substantially the same results as the corresponding element disclosed in the specification. The Saito first antifreeze circulation flow passage "15" as modified by the Salvador water management system is an equivalent of the means plus function limitation because it performs the same function of circulating the antifreeze solution through the fuel cell, antifreeze heater, and the hot medium flow passage that is disposed around a water contact section of the water storing means to allow the antifreeze solution to flow and produces substantially the same result as the corresponding element disclosed in the specification. The Saito second antifreeze circulation flow passage is an equivalent of the mean plus function limitation because it performs the same function of circulating the antifreeze solution through the fuel cell, hot medium flow passage, and the radiator

and produces substantially the same result as the corresponding element disclosed in the specification. The Saito radiator "13" is an equivalent of the mean plus function limitation because it performs the same function of radiating heat from the antifreeze solution flowing through the second antifreeze circulation flow passage and produces substantially the same result as the corresponding element disclosed in the specification.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Saito fuel cell system to include a hot medium flow passage disposed around a water contact section of the water storage unit to allow the antifreeze solution, heated by the antifreeze heater, to flow, wherein the hot medium flow passage has an antifreeze inlet, through which the antifreeze solution flow in, that is located at a higher position than an antifreeze solution outlet, through which the antifreeze solution flows out in order to more efficiently utilize the heated antifreeze to thaw the ice in the water tank during sub freezing conditions.

5. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al (JP 2000-164233) in view of Salvador et al (US 6432568) as applied to claim 1 above, and further in view of Koizumi et al (US 4818845).

However, Saito et al as modified by Salvador et al does not expressly teach a suction conduit heater section disposed around a periphery of a water suction conduit of the water pump to allow the heated antifreeze solution to flow. The Koizumi reference discloses an electric heater "24" disposed around a periphery of a water suction pipe "23" of the bubble pump "20" (See Figure 1 and column 3 line 62 to column 4 line 2).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Saito/Salvador fuel cell system to include a suction conduit heater section disposed around a periphery of a water suction conduit of the water pump to allow the heated antifreeze solution to flow in order to prevent the water suction conduit and the hot medium flow passage inlet from freezing under cold temperature environments.

6. Claims 3-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al (JP 2000-164233) in view of Salvador et al (US 6432568) as applied to claim 1 above, and further in view of Gerstmann et al (US 5772113).

However, Saito et al as modified by Salvador et al does not expressly teach an antifreeze rectification plate disposed in the hot medium flow passage to guide flow of the antifreeze solution; a hot medium flow passage that is disposed along at least a portion of an inner wall of the water storage unit; and a hot medium flow passage that is formed in a plurality of flow passage components that are stacked and water tightly sealed, and wherein the plurality of flow passage components form at least a portion of a side wall of the water storage unit, wherein the hot medium flow passage is formed in a spiral shape. The Gerstmann reference discloses a coolant-to-water heat exchanger "55" that surrounds the water storage tank "31" wherein hot coolant passes through the coil "80" that is wrapped around the tank in a helical fashion or multiple parallel coils (See column 4, lines 50-62 and Figure 2A).

Examiner's note: The antifreeze rectification plate is construed as the flattened part of the tubing that wraps around the water storage tank taught by Gerstmann et al

(See column 2, lines 5-6). The stacked hot medium flow passage components that forms at least a portion of a side wall of the water storage unit is construed as the parallel coils wrapped around the water tank taught by Gerstmann et al.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Saito/Salvador fuel cell system to include an antifreeze rectification plate disposed in the hot medium flow passage to guide flow of the antifreeze solution; a hot medium flow passage that is disposed along at least a portion of an inner wall of the water storage unit; and a hot medium flow passage that is formed in a plurality of flow passage components that are stacked and water tightly sealed, and wherein the plurality of flow passage components form at least a portion of a side wall of the water storage unit, wherein the hot medium flow passage is formed in a spiral shape in order to more efficiently transfer the heat from the hot medium flow passages to the water tank by improving the thermal contact between the flow passages and the water tank.

7. Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al (JP 2000-164233) in view of Salvador et al (US 6432568) as applied to claim 1 above, and further in view of Breault et al (US 6699612).

However, Saito et al as modified by Salvador et al does not expressly teach a switch-over unit adapted to expel the antifreeze solution from the hot medium flow passage to allow air to be admitted to the hot medium flow passage in place of the expelled antifreeze solution; and an antifreeze accommodating unit that, when the hot medium flow passage is admitted with air in place of the antifreeze solution, allows the

air to expel the antifreeze solution such that the expelled antifreeze solution is accommodated. The Breault reference discloses a drain vent "160" and drain valve "158" that are controlled to admit air to assist in the drainage of the antifreeze coolant and a coolant accumulator "64" that allow the air to expel the antifreeze solution such that the expelled antifreeze solution is accommodated (See column 9, lines 45-52 and Figure 2).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Saito/Salvador fuel cell system to include a switch-over unit adapted to expel the antifreeze solution from the hot medium flow passage to allow air to be admitted to the hot medium flow passage in place of the expelled antifreeze solution; and an antifreeze accommodating unit that, when the hot medium flow passage is admitted with air in place of the antifreeze solution, allows the air to expel the antifreeze solution such that the expelled antifreeze solution is accommodated in order to avoid degradation of the antifreeze coolant in the start-up heat exchanger by draining the antifreeze coolant.

8. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al (JP 2000-164233) in view of Salvador et al (US 6432568) and Breault et al (US 6699612) as applied to claim 8 above, and further in view of Yamada et al (US 5482790).

However, Saito et al as modified by Salvador et al and Breault et al does not expressly teach air to be admitted to the hot medium flow passage in place of the antifreeze solution that includes combustion gas resulting from a combustor disposed in

the antifreeze heater. The Yamada reference discloses air heated by mixing the combustion gas from the reforming unit with the air that is fed to the cooling plate "12d" which is part of the cooling flow passage (See column 15, lines 27-30).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Saito/Salvador/Breault fuel cell system to include air to be admitted to the hot medium flow passage in place of the antifreeze solution that includes combustion gas resulting from a combustor disposed in the antifreeze heater in order to shorten the period of time that elapses during the initial time until the generation of electric energy is started with the fuel cell by using combustion gas to heat the fuel cell (See column 15, lines 37-44).

9. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al (JP 2000-164233) in view of Salvador et al (US 6432568) and Breault et al (US 6699612) as applied to claim 8 above, and further in view of Roberts et al (US 2001/0055707).

However, Saito et al as modified by Salvador et al and Breault et al does not expressly teach an air storage unit storing air to be introduced into the hot medium flow passage in place of the antifreeze solution. The Roberts reference discloses purging the coolant water passages by circulating compressed air through them (See paragraph [0049]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Saito/Salvador/Breault fuel cell system to include an air storage unit storing air to be introduced into the hot medium flow passage

in place of the antifreeze solution in order to speed the draining of the antifreeze solution from the hot medium flow passage by using compressed air.

10. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al (JP 2000-164233) in view of Salvador et al (US 6432568) and Breault et al (US 6699612) as applied to claim 8 above, and further in view of Bonville (US 6248462).

However, Saito et al as modified by Salvador et al and Breault et al does not expressly teach an antifreeze temperature detector adapted to detect the temperature of the antifreeze solution in the hot medium flow passage wherein when the temperature of the antifreeze solution is detected to fall in a value higher than 0 C and lower than alpha.C (.alpha.: heat capacity reference temperature of the antifreeze solution), the antifreeze temperature detector controls the hot medium change-over unit so as to allow the air to be admitted to the hot medium flow passage in place of the antifreeze solution. The Bonville reference discloses a thermal management apparatus "30" that includes antifreeze temperature sensors that detect the temperature of the antifreeze solution in the coolant flow channels wherein the antifreeze solution transfers a portion of its heat to the fuel cell assemblies and after which the antifreeze flow are exhausted from the fuel cell stack (See column 6, lines 13-25, column 7 line 67 to column 8 line 3).

Examiner's note: The thermal management apparatus taught by Bonville is capable of detecting when the temperature of the antifreeze solution falls in a value higher than 0°C and lower than alpha C to control the hot medium change over unit so

as to allow the air to be admitted to the hot medium flow passage in place of the antifreeze solution.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Saito/Salvador/Breault fuel cell system to include an antifreeze temperature detector adapted to detect the temperature of the antifreeze solution in the hot medium flow passage wherein when the temperature of the antifreeze solution is detected to fall in a value higher than 0 C and lower than alpha.C (.alpha.: heat capacity reference temperature of the antifreeze solution), the antifreeze temperature detector controls the hot medium change-over unit so as to allow the air to be admitted to the hot medium flow passage in place of the antifreeze solution in order to prevent the antifreeze solution from contaminating the reactant gases after the fuel cell stack is heated above freezing.

11. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al (JP 2000-164233) in view of Salvador et al (US 6432568) as applied to claim 1 above, and further in view of Kanbara et al (JP 2000-149970).

However, Saito et al as modified by Salvador et al does not expressly teach a water temperature detector adapted to detect a water temperature in the water storage unit and a bypass unit adapted to bypass the hot medium flow passage, wherein when the detected water temperature exceeds a preset value, the water temperature detector controls the bypass unit to allow the antifreeze solution to bypass the hot medium flow passage. The Kanbara reference discloses a control unit that detects the temperature of the water tank and bypass valves "13" & "14", wherein the control unit is capable of

switching the valves to allow the antifreeze solution to bypass the hot medium flow passage when the water temperature exceeds a preset value.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Saito/Salvador fuel cell system to include a water temperature detector adapted to detect a water temperature in the water storage unit and a bypass unit adapted to bypass the hot medium flow passage, wherein when the detected water temperature exceeds a preset value, the water temperature detector controls the bypass unit to allow the antifreeze solution to bypass the hot medium flow passage in order to more accurately determine when the ice in the water tank is thawed and to conserve thermal energy by bypassing the hot medium flow passage when not needed.

12. Claims 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al (JP 2000-164233) in view of Salvador et al (US 6432568) and Breault et al (US 6699612) as applied to claim 8 above, and further in view of Nelson (US 5421475).

However, Saito et al as modified by Salvador et al and Breault et al does not expressly teach a water storage unit that includes a double-layer structure composed of an inside tank component and an outside tank component, between which the hot medium flow passage is formed, and a heat insulation member with a specific gravity greater than the air and less than the antifreeze solution is moveably received in the hot medium flow passage; wherein the heating member includes a plurality of members smaller in size than a flow sectional area of the hot medium flow passage formed

between the inside tank component and the outside tank component. The Nelson reference discloses a foam insulation material that is formed into a movable annular collar "22" between the inner wall surface of the outer shell and the outer wall surface of the inner water tank and tapes "50" that are smaller in size than a flow sectional area of the annular space between the outer shell and inner water tank (See claim 6 and Figure 1).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Saito/Salvador/Breault fuel cell system to include a water storage unit that includes a double-layer structure composed of an inside tank component and an outside tank component, between which the hot medium flow passage is formed, and a heat insulation member with a specific gravity greater than the air and less than the antifreeze solution is moveably received in the hot medium flow passage; wherein the heating member includes a plurality of members smaller in size than a flow sectional area of the hot medium flow passage formed between the inside tank component and the outside tank component in order to further improve the thermal efficiency of the water tank by insulating the space between the double layer structure of the tank.

Response to Arguments

13. Applicant's arguments with respect to claims 1-18 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

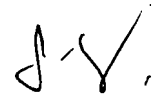
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tony Chuo whose telephone number is (571) 272-0717. The examiner can normally be reached on M-F, 8:30AM to 5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR.

Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

TC



JONATHAN CREPEAU
PRIMARY EXAMINER